

manner and direction of the motions of the extremely lofty air-currents in which the finely-divided material is suspended.

A. S. HERSCHEL

Collingwood, Hawkhurst, September 20

ON September 27, being on the river about 6 p.m., I noticed the beautiful colour of the sky, which lasted for three-quarters of an hour after sunset. The day had been very cloudy, but not much rain had fallen, and about 4.30 p.m. the sky cleared and the sun shone out. My attention was drawn to the appearance of the sky about 6.15, after the sun had set. Great masses of red appeared in the west on a background of gold and primrose; above this the sky shaded from green into blue; the red colour extended upwards for about 40°, and appeared of various shades, deep red, magenta, and rose colour, the various small clouds which were floating about being pink. This red light gradually broadened out and died away, giving place to deep orange and gold, the latter colour lasting till 6.45.

The water was as gorgeous as the sky above, the reflections of the trees being bright red and purple on a floor of gold. I may add that the red light from the sky was so strong that a rosy hue was thrown on some trees and everything around.

Hurley Mill, September 28

T. M. BROWNE

September Stream of Krakatoa Smoke at Strong's Island

AFTER long delay, owing to the wrecking at Strong's Island of the *Morning Star*, I feel very fortunate in coming into possession at last of a most important record of fact, which I hasten to publish, in the form of an extract from the journal of Miss Cathcart, the young lady missionary labouring at Strong's Island with Rev. Dr. and Mrs. Pease, and well known in Honolulu. It is as follows:—

"September 8.—Yesterday there was a very peculiar appearance of the sun. The sky was somewhat cloudy, but not so as to obscure the sun, which was of a silver blue colour, and not so bright but what we could look at it without any trouble. The shadow was the same as in an eclipse. There was no bright sunshine all day."

Although the journal contains no further record on the subject, nor any mention of the red glows which must have followed, it is so precise as to date and as to the phenomena observed as to be of the greatest value in continuing the history of the equatorial smoke-stream from Krakatoa beyond Honolulu and Fanning's Island, to which it had been continuously traced on its long route *via* the Seychelles, Cape Coast Castle, Trinidad, and Panama. It was observed by the barque *Southard Hurlburt* some 2000 miles east-south-east of Honolulu on September 3, at Fanning's Island on September 4, and at Honolulu in conspicuous brilliancy on the evening of the 5th. Mr. Frank Atwater, landing at Maalaea, Maui, on the morning of the 5th, observed a wonderful red glow, and marvelled much (having just arrived) if such were the sunrises in these islands. The same morning passengers on the *Zealandia* steaming southwards towards the Line were awakened by blue sunlight streaming into their berths. Mr. F. L. Clarke has supplied a report, somewhat imperfect as to date, of an obscured and coppery sun seen at the Gilbert Islands on or about September 7. This would be September 6 in our reckoning, the Gilbert Islands being west of the meridian of 180°.

Now we have the very precise date given by Miss Cathcart, of September 7 (6th) at Strong's Island, or just one day later than at Honolulu, and thirty-six hours later than the late afternoon coppery and lurid obscuration seen at Fanning's Island. Strong's Island is about 2320 miles nearly due west of Fanning's Island. This gives a rate of progress of the smoke-stream of sixty-four miles an hour. It seems proper to reckon time from Fanning's Island rather than from the Hawaiian Islands, as the latter were evidently north of the central course of the stream, and perceived its atmospheric effects half a day later than the former, although nearly on the same meridian.

It is to be specially noted also that the phenomena were characterised by the peculiarities seen at Fanning's Island, as well as at Panama, rather than those seen at Honolulu. Here the obscuration of the sun was so slight as not to have been noticed during the day, nor was any change in its colour observed, except by Mr. and Mrs. H. M. Whitney, who saw its disk green at setting on the 5th. At Strong's Island, as well as

at Fanning's Island, Panama, Trinidad, and eastward, the sun was heavily obscured, and its light changed to green at low altitudes, and blue when high up. This proves that the heavier thickness of the smoke-stream did not extend so far north as Honolulu, but was confined to a narrow belt near the equator. Fanning's Island is in lat. 2° 40' N., long. 159° W. Strong's Island is in lat. 5° N., long. 162° 30' E. The *Zealandia* was perhaps 5° N. when the blue sun was observed. Honolulu is in lat. 22° 17' N., and received only the clouds fraying off from the edge of the smoke-belt as it swept by to the southward.

The sun's rays were so greatly obscured by the density of the smoke strata in the main belt that they seem there to have failed to produce the marvellous twilight effects which were so conspicuous in Honolulu. All along the line from Seychelles to Strong's Island, we hear of lurid appearances, green sun, blue light, great obscuration, sun easily observed with the naked eye, but hardly anywhere a word about twilight effects, or red glows; while at Honolulu, under the thinner side clouds of the stream, the colour effects in the twilight were amazing.

The topic is an endless one, and I will not prolong. Many ask what is the cause of frequent revivals of the red glows, such as the very fine one of last evening, August 19. It seems merely to show an irregular distribution of the vast clouds of thin Krakatoa haze still lingering in the upper atmosphere. They drift about, giving us sometimes more, sometimes less, of their presence. It is also not unlikely that in varying hygrometric conditions the minute dust-particles become nuclei for ice crystals of varying size. This would greatly vary their reflecting power. This accords with some observations of Mr. C. J. Lyons, showing that the amount of red glow varies according to the prevalence of certain winds.

S. E. BISHOP

Hawaiian Government Survey, Honolulu, August 20

Biology v. Botany

ACCORDING to the regulations of the Cambridge Local Examinations, 1883, junior students can alone take botany, while senior students must take elementary biology instead. What has been the result? Taking the Regent's Park centre as a typical example, for it is a single school of several hundred girls, and sends up probably more than any other school in England, we find that from 1872 to 1882, inclusive, 273 senior students entered, and 191, or 70 per cent. passed in botany. In 1883, however, *none were sent up at all*. If we ask, What is the object of teaching science in schools? the answer is obviously for its educational value. Now this can only be acquired by practical study. Botany is eminently qualified for affording this use, whereas zoology is not. The lady principal of the school in question will not entertain the idea of teaching any branch of science if it cannot be taught practically, and very pertinently asks, "How can I get two to three hundred frogs, and make my girls dissect them? In the first place, the parents would not allow it." Consequently biology becomes a dead letter, and botany is discountenanced by the Syndicate for the elder girls.

On inquiring of a member of the Syndicate, I am informed that the general idea is that the juniors should study botany from this educational point of view, but seniors are of such an age that mere "object-lessons" are no longer necessary, but training in scientific thought is called for. Now, in the first place, it must be borne in mind that, from the pressure of other subjects, it is not generally, if ever, easy to teach science at all adequately in schools; and, secondly, the small amount of botany that can only possibly be taught, even to the elder pupils, is little more than practical descriptions, a certain acquaintance with the leading families of plants, and the general principles of physiology and histology. There is not the time to do more. As an examiner for the College of Preceptors for many years, and having to look over papers from schools, &c., from all parts of England, I can testify to the fact that the standard of botanical teaching is decidedly low. Of course there are exceptions, but the majority, who get less than half marks, show little more than a smattering of the subject. Instead, therefore, of insisting on elder pupils advancing to biology, my own feeling is that it would be decidedly better to encourage seniors to continue the study of botany alone, but more thoroughly. The idea of calling such botany an "object-lesson" will sound somewhat ludicrous to my fellow teachers, who know what teaching practical botany thoroughly really means!

The remedy, therefore, seems obvious. Let the seniors as before pass in botany alone, but of a higher standard if you

will; and leave biology as it is for any who may wish to take up that subject. At present the effect can only be to quash the teaching entirely beyond its first and most elementary stage.

There are not wanting signs elsewhere of the evil effects of the younger school of botanists not recognising the importance of first training students in a thorough course of practical and systematic botany before proceeding to laboratory work. In an examination lately held for a post at Kew, I am informed that two gentlemen who had been trained at Cambridge competed with a gardener for the post. The gardener secured it. *Verb. sap.* GEORGE HENSLOW

Animal Intelligence

HAVING frequently observed in your columns accounts of remarkable instances of reasoning power in animals, I am tempted to send you the following notes, which may perhaps be not without interest to the readers of NATURE.

A young canary belonging to our family is in the habit of receiving small pieces of biscuit, cake, or such like from the tea-table. The hardness of the biscuit has ever been a source of great annoyance to Dicky. One day, however, after an expectant and close examination of the tea-table, he was offered a piece of hard biscuit. Without making the least attempt to break it, he lifted it from the floor of his cage, and taking it to his water-trough, gently dropped it in, following up the action by patiently stirring it round and round with his beak, until it was in a condition to be eaten. He then carefully removed it and devoured it without any trouble. He now puts every *hard* substance which he deems eatable into the water. He endeavoured to soften sweets in the same way, but finding that the sweet became gradually smaller and smaller, he hastily abstracted it, and has never since put anything of that nature into the water.

An equally interesting case of reasoning power was lately exhibited by our cat. Pussy had lately become the mother of a family of kittens, and was naturally indisposed after the occurrence. She wandered about through the house in a strange manner, as if seeking for something, always, however, keeping within near range of the coal bunkers when they were likely to be required. With a view to finding out what she wanted, the bunkers were left open. The cat immediately entered, and commenced searching diligently among the coals, until she found a piece covered with pyrites. This she proceeded to lick vigorously, returning to the bunker and repeating the operation at regular intervals. On ground sulphur being offered her, she at once forsok the pyrites for that, and ere long, by use of that medicine, regained her usual health.

R. J. HARVEY GIBSON

Zoological Laboratory, University College, Liverpool,
September 29

In the notes on Australian ants forwarded by me by the last mail I forget whether any mention was made respecting an idea that has struck me several times, as to the method in which the antennæ are employed by ants as a means of communicating with each other. That ants utter no audible sound is pretty plainly proved by experiments made with the microphone. It is said that the *Ambillidæ* give a kind of sharp cry when captured, but the statement requires to be verified. Ordinary ants may be generally spoken of as destitute of any means whereby to utter articulate speech. Beyond the fact that they do not appear to be able to speak, so as to be heard by human ears, the tests resorted to by Sir John Lubbock would go to show that it is extremely doubtful whether ants possess the sense of hearing at all. This, however, does not preclude the possibility, or even the probability, of their being in full power of a means by which they are able to converse. It will be remembered that the antennæ are divided into two separate portions, the *scape* and the *flabellum*. The latter is subdivided into about ten separate segments. Now in this arrangement, by adopting a preconcerted system of signals, all the words of an English dictionary might be expressed.

Let us say that A meets B, and, according to the vocabulary of Formicaria, that a touch with the tip of the antenna of A on the terminal segment of the antenna of B signifies any particular word. A similar touch made on the second segment of the antenna of B indicates another word, and so on. Here there is a means of expressing at least ten different words by taking from the point of the flabellum to its base. If the second

point of the flabellum of A is employed as a touching organ, the number of signs that might be conveyed from the one ant to the other would be twenty. If all the segments were thus utilised, a hundred different signs might be interchanged. This is for one antenna only. By utilising the pair this number would be doubled, and by multiplying the number of touches, to express words or plurals of words, also, and by crossing the antennæ so that the right antenna of A touched the left of B, and *vice versa*, all clearly distinct signals, the vocabulary of these little people would be extended almost *ad infinitum*. Say that the one touch of a segment of the flabellum meant an ant, two touches a pair of ants, and three a multitude; here there exists a means by which complicated ideas might be communicated in a manner somewhat similar to that adopted by the Chinese, by whom a particular sign means a woman, two mischief, and three marital unfaithfulness; or, as in the language of the Australian natives, who employ the term "Yarra" as signifying "flowing," and "Yarra-Yarra" as "ever-flowing." All this would be pantomime, of course; but those who have witnessed a public exhibition of the skill of well-taught deaf-mutes, are aware of the amount of information that can be imparted by the simple use of the ten digits, just half the number of separate conversational organs at the disposal of ants. Nor do persons and nations, well able to speak audibly, fail to avail themselves of the same kind of speech. A Chinaman utters a certain word, but it may mean half a dozen different things, as he moves his fingers to the right or to the left, up or down, or describes some imaginary diagrams in the air.

The above views may seem altogether visionary at first sight, but we have been told so many remarkable stories relative to the instincts displayed by the singularly intelligent creatures under consideration, that no persevering student of their habits will be inclined to say that the use by them of some such code of signals is altogether beyond the range of possibility, even of probability.

It might be as well if naturalists, when watching the meeting of ants, would notice carefully whether the observed touches vary in any particular, and whether any noticeable results followed after, and appeared to be connected with, the variations.

THOMAS HARRISON

244, Victoria Parade, East Melbourne, Victoria,
July 16

Meteors

I HAVE to record a brilliant series of meteors seen last night (Sunday, July 20) by myself and others. I will describe that seen by myself, as, amid the many splendid meteors I have observed during my sixty years of life, I have never seen one more magnificent. I was walking up and down my "quarter-deck," the carriage-drive in front of my house, which faces due north and south, admiring the glorious tints of the dying day, for we have been having, on a reduced scale, the grand sunsets about which I have already written. I was looking due north, and saw a huge fireball suddenly appear about half way between the horizon and the zenith. It moved slowly and horizontally, leaving a broad trail of red light behind it, as well defined as that emitted by a rocket. The meteor itself was about half the size of a full moon, white, and of the most intense and dazzling brilliancy. It travelled so slowly that I had time to call out, *several* times, to my wife, "Look at that glorious meteor," and she had time to turn round and see it. At about north-north-west it suddenly broke up into six, if not *seven* pieces, but at this moment its light was so intense that I could not be quite certain; six, however, I counted *distinctly*. They did not *fall*, but trailed on in a line after the larger mass, which did not seem diminished by the rupture, and finally, at north-west, they all disappeared. On taking out my watch I found it was just two minutes past six, and as we are a month past our shortest day, you can fancy there was plenty of daylight left to dim its splendour. But it was a magnificent sight, and its intense brilliancy surpassed anything I have seen before.

At 6.30 two friends walked up to dinner. I asked if they had seen the meteor. They said, "Yes, how splendid it was!" I asked, "Could you count the number of pieces into which it broke?" They looked at each other in amazement. "It did not break!" "In what direction did it pass?" was my next question. "From west to east," said one of them; "if you were standing here you could not have seen it; it was low down on the southern horizon, behind your house." I then